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Title of the Invention: Equipment for on-wafer electronic circuit checking

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SPECIFICATION

(1) Title of the Invention Equipment for on-wafer electronic circuit checking

(2) Scope of Patent Claims

1. Equipment for on-wafer electronic circuit checking, having

a wafer mount for mounting a wafer on which electronic circuits are formed,

a probe needle mount retainer that is situated facing said wafer mount from above, has a window allowing said wafer to look upwards and outwards, and is made of an electromagnetic shielding material,

a probe needle mount that has probe needles and is retained on said probe needle mount retainer with said probe needles extending through said window toward the said wafer mount,

a first electromagnetic shield that is provided on said wafer mount and extends toward the said probe needle mount retainer so as to surround said wafer from the side, and

a second electromagnetic shield that is provided on said probe needle mount retainer so as to cover said probe needle mount,

characterized in that said wafer mount has a base part having a cavity provided from its upper surface, made of an electromagnetic shielding material, and has a wafer mounting part made of electromagnetic shielding material that is situated in said cavity of this base part with an intervening insulator part.

2. Equipment for on-wafer electronic circuit checking as claimed in Claim 1, characterized in that a gas duct is provided opening in the side surface and upper surface of said wafer mount.

3. Equipment for on-wafer electronic circuit checking as claimed in Claim 1, characterized in that a third electromagnetic shield is provided surrounding said wafer mounting part inside the insulator part of said wafer mount.

4. Equipment for on-wafer electronic circuit checking as claimed in Claim 1, Claim 2, or Claim 3, characterized in that said probe needle mount is formed as a card-shaped body,

said second electromagnetic shield comprises a layer of electromagnetic shielding material formed on top of said probe needle mount,

said probe needle mount has coaxial connectors whose earth terminals are connected to said electromagnetic shielding material layer, and coaxial cables whose outer conductors are connected to the earth terminals of said coaxial connectors or to said electromagnetic shielding material layer of the probe needle mount, and whose core conductors are connected at one end to the signal terminals of said coaxial connectors, and

said probe needles are connected to the other ends of the core conductors of said coaxial cables.

5. Equipment for on-wafer electronic circuit checking as claimed in Claim 1, Claim 2, or Claim 3, characterized in that

said probe needle mount is formed as a card-shaped body,

said second electromagnetic shield comprises a layer of electromagnetic shielding material formed on top of said probe needle mount,

said probe needle mount has triaxial connectors whose earth terminals are connected to said electromagnetic shielding material layer, and coaxial cables whose outer conductors are connected to the first signal terminals of said triaxial connectors, and whose core conductors are connected at one end to the second signal terminal of said triaxial connectors, and

said probe needles are connected to the other ends of the core conductors of said coaxial cables.

(3) Detailed description of the invention

[Field of industrial use]

This invention relates to equipment for on-wafer electronic circuit checking wherein electronic circuits on a wafer, such as semiconductor integrated circuits formed on a semiconductor wafer, are checked by bringing probe needles into contact with them.

[Prior art]

In the past, equipment for on-wafer electronic circuit checking has been proposed as discussed in the following with reference to Figure 7.

That is, it comprises base 2 placed inside electronic shielding box 1 which has a lid (not illustrated), and wafer mount 6 is provided on this base 2 so as to fix down and mount wafer 5, on which are formed the electro-

nic circuits, by way of horizontal moving mechanism 3 which moves forwards, backwards and from side to side in the horizontal plane, and vertical moving mechanism 4 which moves vertically.

Also, on base 2, probe needle mount retainer 8 is provided facing wafer mount 6 from above using support rods 7. Here, probe needle mount retainer 8 has window 9 through which wafer 5, which is mounted on and fixed to the top of wafer mount 6, can face upwards and outwards.

Furthermore, in probe needle mount retainer 8, probe needle mount 11 having probe needles 10 is retained with probe needles 10 extending through window 9 of probe needle mount retainer 8 toward the wafer mount 6. Here, probe needle mount 11 has a manipulator mechanism which move the position of needles 10 with respect to wafer mount 6, while needles 10 have a configuration in which they are connected to the main unit of checking equipment (not illustrated) outside electronic shielding box 1 using leads (not illustrated).

The above is the configuration of conventionally proposed equipment for on-wafer electronic circuit checking.

In equipment for on-wafer electronic circuit checking having this type of configuration, the lid of electronic shielding box 1 is opened, wafer 5 is mounted and fixed on wafer mount 6, then the positions of horizontal moving mechanism 3 and vertical moving mechanism 4 are adjusted, and the positions of probe needles 10 of probe needle mount 11 are adjusted with respect to wafer 5

while viewing through window 9 of probe needle mount retainer 8, and in this way it is possible to make probe needles 10 of probe needle mount 11 contact with specified positions on the electronic circuits formed on wafer 5.

Therefore, it is possible to check the electronic circuits formed on wafer 5 by allowing check signals to be transferred between the electronic circuits formed on wafer 5 and the main unit of checking equipment outside electronic shielding box 1 via probe needles 10 of probe needle mount 11 and leads (not illustrated) connected to them.

Also, in the case of equipment for on-wafer electronic circuit checking shown in Figure 7, wafer 5 is electromagnetically shielded from the outside, along with probe needles 10 of probe needle mount 11, by electronic shielding box 1, and therefore checking of the electronic circuits formed on the abovementioned wafer 5 can be performed stably and with almost no influence from external noise.

However, in the case of conventional equipment for on-wafer electronic circuit checking as shown in Figure 7, there has been the drawback that because wafer 5 is electromagnetically shielded from the outside, along with probe needles 10 of probe needle mount 11, by electronic shielding box 1, which surrounds base 2, horizontal moving mechanism 3, vertical moving mechanism 4, wafer mount 6, probe needle mount retainer 8, and so on, the equipment for on-wafer electronic circuit checking as a

whole becomes large and heavy due to the size and weight of this electronic shielding box 1.

Also, in the case of conventional equipment for on-wafer electronic circuit checking as shown in Figure 7, although electronic shielding box 1 electromagnetically shields wafer 5 and probe needles 10 of probe needle mount 11 from noise generated outside electronic shielding box 1, it does not electromagnetically shield wafer 5 and probe needles 10 of probe needle mount 11 from noise generated inside electronic shielding box 1 by, for example, horizontal moving mechanism 3 and vertical moving mechanism 4, and there has therefore been the danger that the checking of the electronic circuits formed on wafer 5 will be affected by the latter noise.

Furthermore, in the case of conventional equipment for on-wafer electronic circuit checking as shown in Figure 7, since there is a large space surrounding wafer 5 due to electronic shielding box 1, there has been the disadvantage of difficulties associated with this, even when checking of the electronic circuits formed on the abovementioned wafer 5 is performed without temperature control of wafer 5 with respect to the outside, either by attempting to dissipate heat generated from wafer 5 to the outside, or conversely by attempting to supply heat to wafer 5 from the outside.

Also, in the case of conventional equipment for on-wafer electronic circuit checking as shown in Figure 7, there has been the disadvantage that since it is necessary to extend the leads of probe needles 10 of probe

needle mount 11 for a long distance outside electronic shielding box 1 to the main unit of checking equipment, there is a fixed limit to how far the frequency of check signals used for checking the electronic circuits formed on the abovementioned wafer 5 can be increased, and consequently it is difficult to use high-frequency check signals to check the electronic circuits formed on the wafer.

Also, equipment for on-wafer electronic circuit checking has been proposed as discussed below with reference to Figure 8. Note that in Figure 8, parts corresponding to those in Figure 7 have been given exactly the same reference numbers, and details of their description are omitted.

The conventional equipment for on-wafer electronic circuit checking shown in Figure 8 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 7, except for the following items.

That is, electronic shielding box 1 is omitted.

However, wafer mount 6 and probe needle mount retainer 8 are made of electromagnetic shielding material (an electrical conductor).

Also, electromagnetic shield 12 is provided on wafer mount 6, extending toward the probe needle mount retainer 8 so as to enclose from the side wafer 5 which is mounted on wafer mount 6. Here, wafer mount 6 is made cylindrical and male screw thread 6a is formed at the top of its outer surface. Furthermore, electromagnetic shield 12 is

a circular tube on the inner surface of which is formed female screw thread 12a which fits into male screw thread 6a of wafer mount 6.

Furthermore, electromagnetic shield 13 is provided on probe needle mount retainer 8, covering probe needle mounts 11 having needles 10. Here, electromagnetic shield 13 consists of a cover which covers probe needle mounts 11 without touching it.

The above is the configuration of another type of conventionally proposed equipment for on-wafer electronic circuit checking.

With conventional equipment for on-wafer electronic circuit checking having this type of configuration, with electromagnetic shield 12 in the lowered position, wafer 5 on which the electronic circuits are formed is mounted on wafer mount 6 and, as in the case of the equipment for on-wafer electronic circuit checking mentioned above in Figure 7, probe needles 10 of probe needle mount 11 are brought into contact with specific positions on the electronic circuits formed on this wafer 5, and then, with electromagnetic shield 12 raised up until it touches or faces closely onto probe needle mount retainer 8, checking of the electronic circuits formed on wafer 5 can be performed by transferring check signals to be between the electronic circuits formed on wafer 5 and the main unit of checking equipment outside the space enclosed by wafer mount 6, probe needle mount retainer 8 and electromagnetic shields 12 and 13, via probe needles 10 of probe needle mount 11 and the leads connected to them.

Also, in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8, wafer mount 6 and probe needle mount retainer 8 function as electromagnetic shields since they are made of electromagnetic shielding material, and also since wafer 5 is surrounded, along with probe needles 10 of probe needle mount 11, by the wafer mount 6 and probe needle mount retainer 8 and electromagnetic shields 12 and 13, wafer 5 is electromagnetically shielded, along with probe needles 10 of probe needle mount 11, from the outside.

Therefore, checking of electronic circuits formed on the wafer as mentioned above can be stably performed with almost no influence from external noise, as in the case of the conventional equipment for on-wafer electronic circuit checking as mentioned above in Figure 3.

Also, in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8, although wafer 5, along with probe needles 10 of probe needle mount 11, are electromagnetically shielded from the outside, since wafer mount 6, probe needle mount retainer 8, electromagnetic shield 12 provided between wafer mount 6 and probe needle mount retainer 8, and electromagnetic shield 13 provided on probe needle mount retainer 8 are used, the equipment for on-wafer electronic circuit checking as a whole hardly becomes any larger or heavier as a result, and consequently in this respect it does not have the drawback of the conventional equipment for on-wafer electronic circuit checking as mentioned above in Figure 7.

Also, in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8, by providing wafer mount 6 on base 2 via horizontal moving mechanism 3 and vertical moving mechanism 4, as in the case of the abovementioned conventional equipment for on-wafer electronic circuit checking of Figure 7, even if noise is generated with respect to wafer 5 and probe needles 10 of probe needle mount 11 by the horizontal moving mechanism 3 and vertical moving mechanism 4, this noise is reliably electromagnetically shielded by wafer mount 6, probe needle mount retainer 8, and electromagnetic shields 12 and 13. Thus, there is almost no danger of the checking of electronic circuits formed on the abovementioned wafer 5 being affected by noise, and consequently in this respect it does not have the drawback of the conventional equipment for on-wafer electronic circuit checking as mentioned above in Figure 7.

Furthermore, in the case of conventional equipment for on-wafer electronic circuit checking as shown in Figure 8, even though wafer 5 is surrounded by wafer mount 6 and probe needle mount retainer 8, and electromagnetic shields 12 and 13, this space is much smaller compared with the space of electronic shielding box 1 surrounding wafer 5 in the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 7, and as a result when the abovementioned checking of electronic circuits formed on wafer 5 is performed with temperature control of wafer 5 with respect to the outside, either by attempting to dissipate heat

generated from wafer 5 to the outside, or conversely by attempting to supply heat to wafer 5 from the outside, it can be performed easily compared with the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 7, and consequently in this respect it does not have the disadvantage of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 7.

Also, in the case of conventional equipment for on-wafer electronic circuit checking shown in Figure 8, the main unit of checking equipment for transferring check signals between the electronic circuits formed on wafer 5 is provided outside the space surrounded by wafer mount 6, probe needle mount retainer 8, and electromagnetic shields 12 and 13, but since this space is only a small fraction of the size of electronic shielding box 1 of the abovementioned conventional equipment for on-wafer electronic circuit checking of Figure 3, the probe needles 10 of probe needle mount 11 do not have to be extended for a long distance to reach the main checking equipment using leads, and it is therefore easy to check the electronic circuits formed on the wafer using high frequency check signals.

Furthermore, equipment for on-wafer electronic circuit checking has been proposed as discussed in the following with reference to Figure 9. Note that in Figure 9, parts that correspond to those in Figure 8 are given exactly the same reference numbers, and details of their description are omitted.

Apart from the following items, the conventional equipment for on-wafer electronic circuit checking shown in Figure 9 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8.

That is, probe needle mount 11 is a card-shaped body in which is formed window 11a through which probe needles 10 extend, and electromagnetic shielding material (conducting material) layer 14 is formed on this card-shaped probe needle mount 11. Next, this probe needle mount 11 is positioned and installed on probe needle mount retainer 8 by clamp plate 15 made of electromagnetic shielding material (conducting material) and screw means 16, which is made of electromagnetic shielding material (conducting material) and is screwed into probe needle mount retainer 8 through the clamp plate 15. Here, clamp plate 15 makes contact with electromagnetic shielding material layer 14 on probe needle mount 11, and electromagnetic shield 13 is constituted by electromagnetic shielding material layer 14 and clamp plate 15.

Also, window 11a of probe needle mount 11 is closed off from above by cover plate 17 made of electromagnetic shielding material.

The above is the configuration of a further type of conventionally proposed equipment for on-wafer electronic circuit checking.

With conventional equipment for on-wafer electronic circuit checking having this kind of configuration, the

configuration is the same as that of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 except for the abovementioned items, and details of its description are omitted, but the same operational results are obtained as with the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8.

[Problems to be solved by the invention]

In the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9, the abovementioned disadvantages of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 7 are effectively avoided, as discussed above.

Incidentally, in the past, in the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9, since it is desirable to take measurements of the current flowing through wafer 5, the current flowing through this wafer 5 is taken out to the external checking equipment via wafer mount 6.

However, in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9, since wafer mount 6 itself is not electromagnetically shielded from the outside, there is a danger that the current flowing through wafer 5 will be affected by noise as it passes through wafer mount 6.

Consequently, in the case of the conventional equipment for on-wafer electronic circuit checking

mentioned above in Figure 8 and Figure 9, when the current flowing through wafer 5 is taken out to the external checking to take equipment via wafer mount 6 measurements, there is a danger that the current flowing through this wafer 5 will be affected by noise, and there is thus the disadvantage that it is not possible to accurately measure the current flowing through wafer 5.

Thus, this invention aims to provide novel equipment for on-wafer electronic circuit checking that does not have the abovementioned disadvantages.

[Means of solving the problems]

As in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9, the equipment for on-wafer electronic circuit checking according to this invention has the configuration discussed below.

That is, it has (1) a wafer mount for mounting the wafer on which electronic circuits are formed, (2) a probe needle mount retainer that is situated facing this wafer mount from above, has a window allowing said wafer to look upwards and outwards, and is made of an electromagnetic shielding material, (3) a probe needle mount that has probe needles and is retained on said probe needle mount retainer with said probe needles extending through said window toward the said wafer mount, (4) a first electromagnetic shield that is provided on said wafer mount and extends toward the said probe needle mount retainer so as to surround said wafer from the side, and (5) a second electromagnetic shield

that is provided on said probe needle mount retainer so as to cover said probe needle mount.

With the equipment for on-wafer electronic circuit checking of the present invention, however, in equipment for on-wafer electronic circuit checking having the abovementioned configuration, its wafer mount has a base part having a cavity provided from its upper surface, made of an electromagnetic shielding material, and has a wafer mounting part made of electromagnetic shielding material that is situated in said cavity of this base part with an intervening insulator part.

[Operation and effect]

With the equipment for on-wafer electronic circuit checking according to this invention, the wafer mount has the same configuration as in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9 except that it has the abovementioned base part and the abovementioned wafer mounting part, and so details of the description are omitted; however, like the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9, it is possible to perform checking of the electronic circuits formed on the wafer by transferring check signals between the electronic circuits formed on the wafer and the main units of the checking equipment via the probe needles, and furthermore this checking can be performed having the same characteristics as in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8

and Figure 9.

However, in the case of equipment for on-wafer electronic circuit checking according to this invention, the wafer mount has the abovementioned base part and the abovementioned wafer mounting part, and since this wafer mounting part is electromagnetically shielded from the outside by the base part, when the current passing through the wafer is taken out through the wafer mount to the outside and measured, the current passing through this wafer is either virtually unaffected by noise as it passes through the inside of the wafer mount, or even if it is affected, it is a negligible quantity.

As a result, the current passing through the wafer can be measured more accurately than in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 and Figure 9.

[Embodiment 1]

In the following, a first embodiment of equipment for on-wafer electronic circuit checking is discussed with reference to Figure 1.

In Figure 1, parts that correspond to those in Figure 8 are given the same reference numbers, and their detailed description is omitted.

Apart from the following items, the equipment for on-wafer electronic circuits checking according to this invention as shown in Figure 1 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8.

That is, wafer mount 6 has base part 21 having

cavity 22 provided from its upper surface, and has wafer mounting part 24 situated inside this cavity 22 of base part 21 with an intervening insulator part 23 made of, for example, a synthetic resin.

In this case, base part 21 and wafer mounting part 24 are both made of electromagnetic shielding material.

Also, male screw 6a which fits into female screw 12a of electromagnetic shield 12 is formed in base part 21.

Furthermore, inside base part 21 of wafer mount 6, wiring hole 25 is provided opening in the inside surface of cavity 22 and the side surface of base part 21, and insulator part 23 also extends through the inside of this wiring hole 25.

Also, a coaxial connector 26 is installed in the opening position of wiring hole 25 on the side surface of base part 21, and the earth terminal (outer conductor) of this coaxial connector 26 is connected to base part 21, while the signal terminal (core conductor) is connected to wafer mounting part 24 via lead 27 extending through insulator part 23.

Furthermore, in electromagnetic shield 13 provided on probe needle mount retainer 8, other coaxial connectors 28 are installed from its outer side, and the earth terminals (outer conductors) of these coaxial connectors 28 are connected to electromagnetic shield 13, and the signal terminals (core conductors) are connected to probes 10 mounted on probe mount 11, via leads 29.

The above is the configuration of a first embodiment of equipment for on-wafer electronic circuit checking

according to this invention.

With equipment for on-wafer electronic circuit checking according to this invention having this kind of configuration, since it has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8 apart from the abovementioned items, details of the description are omitted; however, as in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8 as mentioned above in the [Prior art] section, by transferring check signals between the electronic circuits formed on wafer 5 and the main unit of checking equipment via probe needles 10, it is possible to check the electronic circuits formed on wafer 5, and this check can be performed with the same characteristics as in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8 as mentioned above in the [Prior art] section.

Note that when checking of the electronic circuits formed on wafer 5 is performed, in addition to the probe needles 10, the check signals must be transferred through leads 29, coaxial connectors 28, and the coaxial cables (not illustrated) extending from these connectors 28 to the main unit of checking equipment.

However, with equipment for on-wafer electronic circuit checking according to this invention as shown in Figure 1, if coaxial cables (not illustrated) are extended from the coaxial connectors 26 provided on base

part 21 of wafer mount 6 to the main units of the checking equipment, the current passing through wafer 5 can be made to flow to the main units of the checking equipment through wafer mounting part 24 of wafer mount 6, lead 27, coaxial connector 26, and coaxial cables extending to the main units of the checking equipment, and therefore the current passing through wafer 5 can be measured in the main unit of checking equipment.

Further, in this case, wafer mounting part 24 of wafer mount 6 and lead 27 are electromagnetically shielded from the outside by base part 21 of wafer mount 6, and therefore there is almost no danger of the current flowing through wafer 5 being affected by noise as it passes through wafer mounting part 24 of wafer mount 6 and lead 27.

As a result, the current flowing through wafer 5 can be measured more accurately in the main unit of checking equipment than in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8.

[Embodiment 2]

In the following, a second embodiment of equipment for on-wafer electronic circuit checking is discussed with reference to Figure 2.

In Figure 2, parts that correspond to those in Figure 1 and Figure 9 are given the same reference numbers, and their detailed description is omitted.

Apart from the following items, the equipment for on-wafer electronic circuit checking according to this

invention as shown in Figure 2 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 9.

That is, as in the case of equipment for on-wafer electronic circuit checking according to this invention as mentioned above in Figure 1, wafer mount 6 has base part 21 having cavity 22 provided from its upper surface, and has wafer mounting part 24 situated inside this cavity 22 of base part 21 with an intervening insulator part 23 made of synthetic resin, for example.

In this case, base part 21 and wafer mounting part 24 are both made of electromagnetic shielding material, as in the case of the equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 1.

Also, male screw 6a which fits into female screw 12a of electromagnetic shield 12 is formed in base part 21, as in the case of the equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 1.

Furthermore, inside base part 21 of wafer mount 6, as in the case of the equipment for on-wafer checking of electronic circuits according to this invention mentioned above in Figure 1, wiring hole 25 is provided opening in the inside surface of cavity 22 and the side surface of base part 21, and insulator part 23 also extends through the inside of this wiring hole 25. Furthermore, on the side surface of base part 21, as in the case of the equipment for on-wafer electronic circuit inspection

according to this invention mentioned above in Figure 1, a coaxial connector 26 is installed in the opening position of wiring hole 25, the earth terminal (outer conductor) of the coaxial connector 26 is then connected to base part 21, and the signal terminal (core conductor) is connected to wafer mounting part 24 via lead 27 extending through the inside of insulator part 23.

Furthermore, as can be clearly seen by referring also to Figure 5, triaxial connectors 31 are installed on electromagnetic shielding layer 4 provided on probe needle mount 11, the earth terminals (outer conductors) of these triaxial connectors 31 are connected to electromagnetic shielding layer 14, while the first signal terminals (core conductors) are connected to probe needles 10 mounted on probe needle mount 11 via the core conductors of coaxial cables 32, and the second signal terminals (the annular conductors between the core conductors and the outer conductors) are connected to the outer conductors of coaxial cables 32.

The above is the configuration of a second embodiment of equipment for on-wafer electronic circuit checking according to this invention.

With equipment for electronic circuit checking according to this invention having this type of configuration, since it has the same configuration as in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 9 apart from the abovementioned items, details of the description are omitted, but as in the case of the

conventional equipment for on-wafer electronic circuit checking shown in Figure 9 as mentioned above in the [Prior art] section, by transferring check signals between the electronic circuits formed on wafer 5 and the main unit of checking equipment via probe needles 10, it is possible to check the electronic circuits formed on wafer 5, and this check can be performed with the same characteristics as in the case of the conventional equipment for on-wafer electronic circuit checking shown in Figure 8 as mentioned above in the [Prior art] section.

Note that when checking of electronic circuits formed on wafer 5 is performed, the check signals are transferred not only through probe needles 10, but also through coaxial cables 32, triaxial connectors 31, and triaxial cables (not illustrated) extending from these triaxial connectors 31 to the main unit of checking equipment.

However, with the equipment for on-wafer electronic circuit checking according to this invention as shown in Figure 2, as in the case of equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 1, if a coaxial cable (not illustrated) is extended from coaxial connector 26 provided on base part 21 of wafer mount 6 to the main unit of checking equipment, the current passing through wafer 5 can be made to flow to the main unit of checking equipment through wafer mounting part 24 of wafer mount 6, lead 27, coaxial connector 26, and the coaxial cable

extending to the main unit of checking equipment, and therefore the current passing through wafer 5 can be measured in the main unit of checking equipment.

Further, in this case, as in the case of equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 1, wafer mounting part 24 of wafer mount 6 and lead 27 are electromagnetically shielded from the outside by base part 21 of wafer mount 6, and thus there is almost no danger of the current passing through wafer 5 being affected by noise as it passes through wafer mounting part 24 of wafer mount 6 and lead 27.

As a result, the current flowing through wafer 5 can be measured more accurately in the main unit of checking equipment than in the case of the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 8.

[Embodiment 3]

In the following, a third embodiment of equipment for on-wafer electronic circuit checking is discussed with reference to Figure 3.

In Figure 3, parts that correspond to those in Figure 2 are given the same reference numbers, and their detailed description is omitted.

Apart from the following items, the equipment for on-wafer electronic circuits checking according to this invention as shown in Figure 3 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 2.

That is, a gas duct 41 is provided in wafer mount 6 opening in its side surface to its upper surface.

In this case, gas duct 41 may be extended to pass through base part 21 of wafer mount 6, insulator part 23 and wafer mounting part 24, or alternatively it may only pass through base part 21 and insulator part 23, but as illustrated, it is also possible to extend it only through insulator part 23 when a hole 42 is provided opening in the bottom surface and side surface of this cavity 22 in base part 21, and insulator part 23 is extended through the inside of this hole 42. Note that 43 is a gas pipe connector provided to allow gas to flow between the side surface of base 21 and gas duct 41.

Also, in cover plate 17, gas duct 44 is provided opening from its lower surface to its side surface.

The above is the configuration of the third embodiment of the equipment for on-wafer electronic circuit inspection according to this invention.

With equipment for on-wafer electronic circuit inspection according to this invention having this kind of configuration, since it has the same configuration as the abovementioned equipment for on-wafer checking of electronic circuits according to this invention of Figure 2, details of the description are omitted, but it has the same characteristics as the equipment for on-wafer electronic circuit checking mentioned above in Figure 2.

However, in the case of the equipment for on-wafer checking of electronic circuits according to this inven-

tion shown in Figure 3, since it has gas duct 41 in wafer mount 6 and gas duct 44 in cover 17, if a gas tube (not illustrated) is connected to gas duct 31 via gas pipe connector 43, and heated or warmed gas is made to flow into it, this passes through gas duct 41, then passes through the space between wafer mount 6 and probe needle mount retainer 8, then passes through window 11a of probe needle mount 11, and then flows outside through gas duct 44, and since it is possible to heat or warm wafer 5 in this gas flow process, it becomes easy to check the electronic circuits formed on wafer 5 with the temperature of the electronic circuits as a parameter.

[Embodiment 4]

In the following, a fourth embodiment of equipment for on-wafer electronic circuit checking according to the present invention is discussed with reference to Figure 4.

In Figure 4, parts that correspond to those in Figure 2 are given the same reference numbers, and their detailed description is omitted.

Apart from the following items, the equipment for on-wafer electronic circuit checking according to this invention as shown in Figure 4 has the same configuration as the conventional equipment for on-wafer electronic circuit checking mentioned above in Figure 2.

That is, inside insulator part 23 which is incorporated in wafer mount 6, electromagnetic shield 51 is provided surrounding wafer mounting part 24. In this case, electromagnetic shield 51 is allowed to extend

above wafer mount 6 so as to face the upper surface of wafer mount 6 as illustrated.

Also, triaxial connector 52 is substituted for coaxial connector 26, the earth terminal (external conductor) of this triaxial connector is connected to base part 21 of wafer mount 6, the first signal terminal (core conductor) is connected to wafer mounting part 24 of wafer mount 6 via lead 53, the second signal terminal (the annular section conductor between the core conductor and the outer conductor) is connected to electromagnetic shield 41 via lead 54.

The above is the configuration of a fourth embodiment of equipment for on-wafer electronic circuit checking according to this invention.

In equipment for on-wafer electronic circuit checking according to this invention having this sort of configuration, since it has the same configuration as the equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 2 apart from the abovementioned items, it has the same characteristics as in the case of equipment for on-wafer electronic circuit checking according to this invention mentioned above in Figure 2.

However, in the case of the equipment for on-wafer electronic circuit checking according to this invention shown in Figure 4, since it has electromagnetic shield 51, a greater electromagnetic shielding effect can be achieved compared with the case of the equipment for on-wafer electronic circuit checking mentioned above in

Figure 2, and since electromagnetic shield 51 is connected to the second signal terminal of triaxial connector 42, electromagnetic shield 41 can be brought to the same electrical potential as wafer mounting part 24 via triaxial connector 52 and lead 54, and thus it is possible to effectively avoid electromagnetic inductive noise.

Note that in the above discussion, only a few examples of equipment for on-wafer electronic circuit checking according to this invention have been shown, for example it is also possible to adopt a configuration in which, in the configuration mentioned above in Figure 2, the female screw threads 12a of the cylindrical electromagnetic shield 12 and the male screw thread 6a of wafer mount 6 are omitted, and using a magnet attached to the top surface of electromagnetic shield 12 or the lower surface of probe needle mount retainer 8, electromagnetic shield 12 is fixed to the lower surface of probe needle mount retainer 8 so that it is provided between wafer mount 6 and probe needle mount retainer 8; it is also possible to adopt a configuration in which the cylindrical electromagnetic shield 12 is situated in a ring-shaped channel previously formed in the top surface of wafer mount 6 from its top surface, and then inserting a spring between this electromagnetic shield 12 and probe needle mount retainer 8 so that it is provided between wafer mount 6 and probe needle mount retainer 8; and furthermore it is possible to adopt a configuration in which cover plate 17 and electromagnetic shielding

material layer 14 formed on card-shaped probe needle mount 11 in the configuration shown in Figure 2 are replaced with the same type of cover as electromagnetic shield 13 shown in Figure 1.

Also, as shown in Figure 5 it is also possible to extend electromagnetic shielding material layer 14 in the inner surface of window 11a and the lower surface of probe needle mount 11 mentioned above in Figure 2.

Furthermore, as shown in Figure 6, it is also possible to adopt a configuration in which triaxial connector 31 is replaced by coaxial connector 61, and a variety of other different types and variations can be obtained without departing from the spirit of this invention.

(4) Brief description of the figures

Figure 1 is a front view sketch showing a cross section of part of a first embodiment of equipment for on-wafer electronic circuit checking according to this invention.

Figure 2 is a front view sketch showing a cross section of part of a second embodiment of equipment for on-wafer electronic circuit checking according to this invention.

Figure 3 is a front view sketch showing, partially in cross section, the essential features of a third embodiment of equipment for on-wafer electronic circuit checking according to this invention.

Figure 4 is a front view sketch showing, partially in cross section, the essential features of a fourth

embodiment of equipment for on-wafer electronic circuit checking according to this invention.

Figure 5 is a partial cross sectional diagram showing details of the probe needle mount of the equipment for on-wafer electronic circuit checking according to this invention shown in Figure 2.

Figure 6 is a partial cross sectional diagram showing details of another probe needle mount that can be used in the equipment for on-wafer electronic circuit checking according to this invention shown in Figure 2, Figure 3 and Figure 4.

Figure 7, Figure 8 and Figure 9 are front view sketches showing partial cross sections of conventional equipment for on-wafer electronic circuit checking.

1 ... ... electronic shielding box

2 ... ... base

3 ... ... horizontal moving mechanism

4 ... ... vertical moving mechanism

5 ... ... wafer

6 ... ... wafer mount

6a .. .. screw

7 ... ... support rod

8 ... ... probe needle mount retainer

9, 11a .. ... window

10 ... ... probe needle

11 ... ... probe needle mount

12, 13 ... ... electromagnetic shield

12a .. .. female screw thread

14 ... ... electromagnetic shielding material layer

15 ... ... clamp plate

16 ... ... screw means

17 ... ... cover plate

21 ... ... base part

22 ... ... cavity

23 ... ... insulator part

24 ... ... wafer mounting part

25 ... ... wiring hole

26 ... ... coaxial connector

31 ... ... triaxial connector

32 ... ... coaxial cable

41, 44 ... ... gas ducts

42 ... ... hole

43 ... ... gas connector

51 ... ... electromagnetic shield

61 ... ... coaxial connector

Figure 1

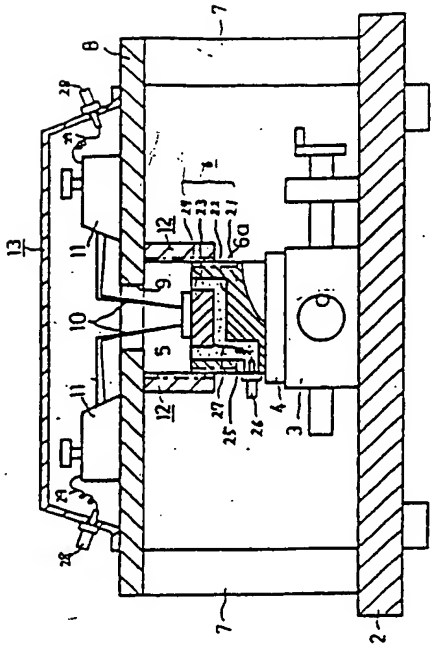


Figure 2

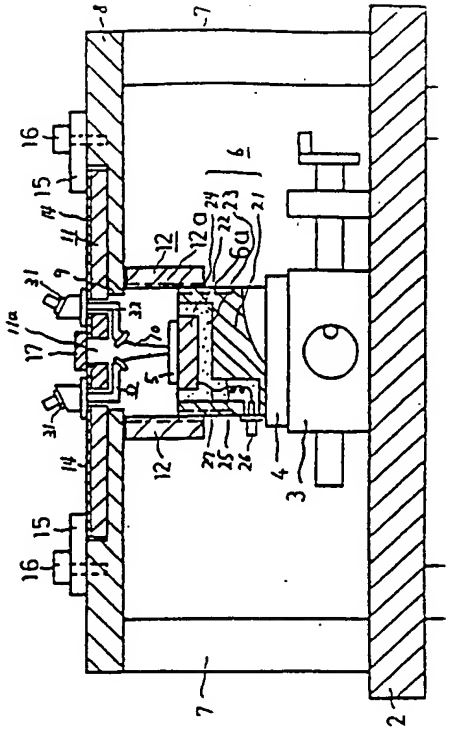


Figure 3

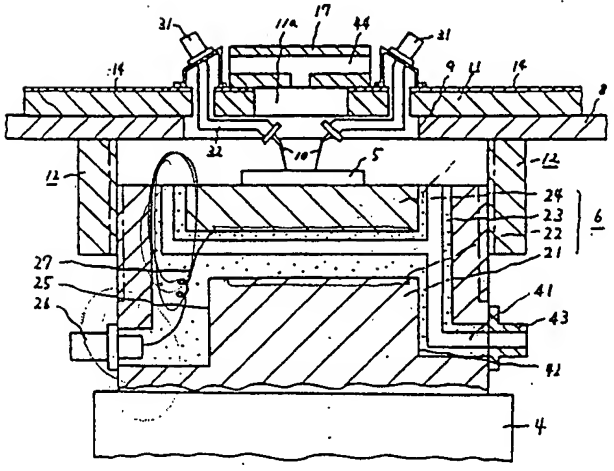


Figure 4

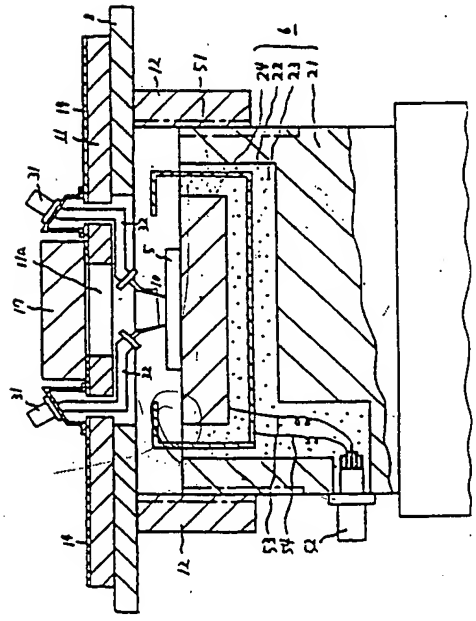


Figure 7

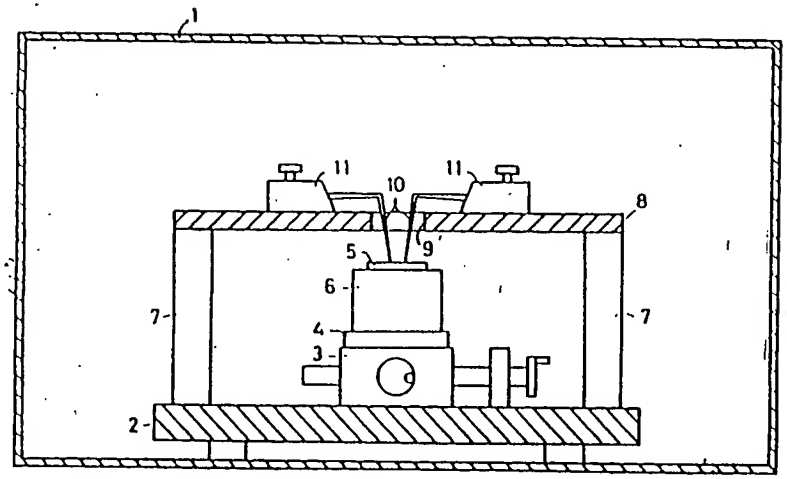


Figure 5

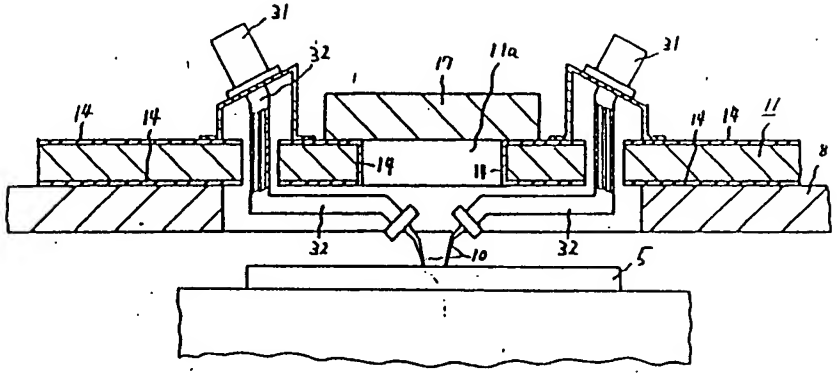


Figure 8

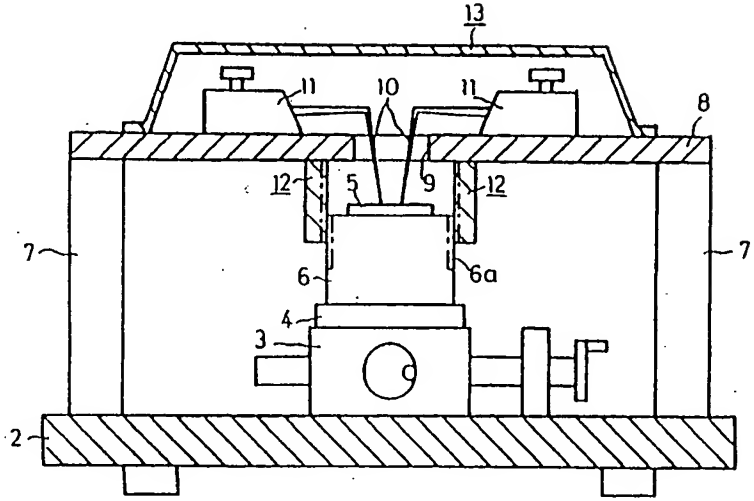


Figure 6

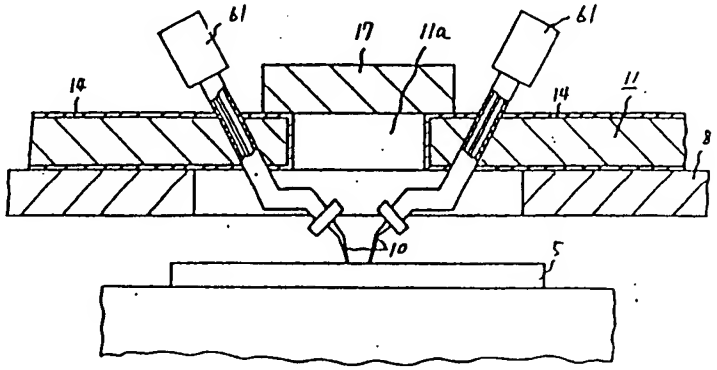
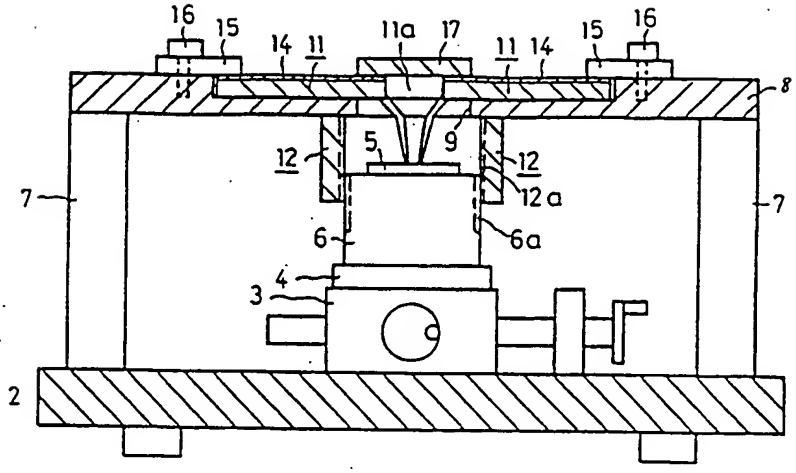


Figure 9



Translator's Report/Comments

Jap. Patent Pub No. 220,453/90

Your ref: 60366 Your order of (date):

In translating the above text we have noted the following apparent errors/unclear passages which we have corrected or amended:

Page/para/line*	Comment
3 / BR / 12	"Probe needle mount 10" should presumably read "probe needle mount 11".

* This identification refers to the source text. Please note that the first paragraph is taken to be, where relevant, the end portion of a paragraph starting on the preceding page. Where the paragraph is stated, the line number relates to the particular paragraph. Where no paragraph is stated, the line number refers to the page margin line number.